**Eucharitidae (Hymenoptera), a chalcid wasp family
new to the fauna of Poland**

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ABSTRACT. *Eucharis adscendens* (FABRICIUS, 1787) (Hymenoptera: Chalcidoidea: Eucharitidae) is reported as occurring in the Mazovian Lowland in central Poland. This represents the first record of the entire family Eucharitidae in Poland, which extends further to the north the geographical range of Eucharitidae in central Europe. *E. adscendens* was observed ovipositing into the flower buds of an umbellifer *Peucedanum oreoselinum* (L.) MOENCH. The most likely hosts of this chalcid species at this Mazovian location are ants of the genus *Formica* L.

KEY WORDS: *Eucharis adscendens*, Eucharitidae, Chalcidoidea, ant parasitoid, Poland, new oviposition plant.

INTRODUCTION

The Eucharitidae (Hymenoptera: Apocrita: Chalcidoidea) is a monophyletic group of solitary parasitoids of ant pupae (HERATY 2002). It was recognized as a family by WALKER in 1846 (Eucharidae, pro partim), and currently includes the Eucharitinae, Oraseminae and Gollumiellinae (HERATY et al. 2004). The phylogenetic relationship between the subfamilies of the Eucharitidae and their sister taxa is as follows: (Chrysolampinae + (Philominidae + (Perilampinae + Akapalinae + Eucharitidae))) (GIBSON et al. 1999). Several morphological features distinguish the Eucharitidae from other chalcid wasps. All members of this family have elongate and sickle-shaped mandibles; a labrum with a single row of marginal digits; a reduced pronotum, which is positioned ventral to the mesoscutum making it invisible in the dorsal view; a large and convex scutellum, often with long posterior projections; a laterally compressed ascendant gaster on an elongated petiole, with

the first tergum usually concealing the subsequent terga. The developmental cycle of the Eucharitidae is complex (CLAUSEN 1940, 1941, BOUČEK 1956, HERATY 2002). They deposit eggs into or on specific plants, and the active planidial first instar larvae are usually carried from the plant to the ant nest by passing ant workers or, in some cases, by an intermediate carrier/host. Once in the nest, they attach to or enter mature ant larvae. However, the planidia generally wait until the ant larvae reach the prepupal or pupal stage before beginning to feed. The second and the third (final) larval instars are hymenopteriform. Pupation takes place in the ant nest.

Although the Eucharitidae are worldwide in distribution, this group is most common and diverse in the tropics (HERATY 2002). Of the 53 currently recognized genera of these chalcids, only *Eucharis* LATR. and *Stilbula* SPIN. are represented in the warmer areas of Europe (HERATY 2002, NOYES 2010). In the early 1920s, NOSKIEWICZ repeatedly noted the occurrence of *Stilbula cyniformis* (ROSSI, 1792) in Podolia, specifically the Dniestr ravine between Dobrowolany and Gródek (NOSKIEWICZ 1924, KUNTZE & NOSKIEWICZ 1938). However, no Eucharitidae species has been recorded within the contemporary borders of Poland (NOYES 2010, last updated January 2011). In this study, I report the finding in central Poland of a colony of the nominal Eucharitidae species, *Eucharis* (*Eucharis*) *adscendens* (FABRICIUS, 1787) (Eucharitinae).

MATERIALS AND METHODS

The data presented here were gathered during the course of ongoing studies on the entomofauna of xerothermic biotopes formed on the sandy soil and postglacial dunes in the proglacial stream valley (pradolina) of the River Vistula, west of Warsaw. The climate of this area is characterized by warm summers and cool winters, and has one of the lowest levels of annual average precipitation in Poland (BŁAŻEJCZYK 2002). The insects were collected following visual inspection of plants, nesting sites on the ground, and by sweeping the vegetation with a net. The identification of *E. adscendens* was checked using keys for Chalcidoidea (NIKOLSKAYA 1952, TRJAPITZIN 1978), and from the original descriptions of *Eucharis* species (RUSCHKA 1924, HOFFER & NOWICKY 1954, BOUČEK 1956, ANDRIESCU 1968). The insect nomenclature follows that defined by Fauna Europaea (2010), and the plant nomenclature follows Flora Europaea (TUTIN et al. 1992). Example specimens of *E. adscendens* and its putative ant hosts are archived in the Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw.

RESULTS AND DISCUSSION

Eucharis adscendens was found on 4 July 1992 in the Bemowo Forest, at a location close to the city limits of Warsaw (52°16'00" N, 20°52'20" E; UTM: DC99) (Fig. 1). The presence of *E. adscendens* at this site was also recorded during the last few days of June in

1993. Numerous specimens of this chalcid were observed in flight and ovipositing inside the developing flower buds of the mountain-parsley *Peucedanum oreoselinum* (L.) MOENCH (Umbelliferae) growing in psammophilic plant communities of the class *Sedo-Scleranthetea*. The site of observation was located on the dry, insolated edge of a mixed forest (association *Quercus-Pinetum*). Other xero- and thermophilic insects noted at the site occupied by the *E. adscendens* colony included two longhorn beetles, *Phytoecia nigricornis* (F., 1781) and *Phytoecia pustulata* (SCHR., 1776) (Coleoptera: Cerambycidae).

Fig. 1. Geographical distribution of *Eucharis adscendens* in the western Palearctic. The locality of the *E. adscendens* population in Mazovia is shown by the asterisk. The open circles indicate localities requiring confirmation (see text for details).

Morphologically, the *E. adscendens* specimens of the Mazovian population do not differ significantly from the typical form of this species (Fig. 2). The bodies of the adult wasps were about 5 mm in length and iridescent green, as recorded in the most common variety, with reflective sections of violet-blue (axillulae and metanotum) and copper (metasoma).

Their legs were yellow or testaceous in colour, except for the pretarsi, the apical end of the apical tarsomeres, the basal section (half to two-thirds) of the femora, and trochanters, which were dark-brown, and the coxae, which were concolorous with the thorax. However, the marginal rim of the female scutellum was not clearly bidentate, a variable also noted by RUSCHKA (1924). *E. adscendens* is relatively easy to distinguish from similar *Eucharis* species occurring in countries adjoining Poland in the south and southeast (the Czech Republic, Slovakia, Ukraine) by the presence of a smooth, shiny sculpture on the dorsal part of the thorax that is covered with only sparse and fine punctation, the presence of stout and distinctly moniliform antennae, and the presence of a posteriorly dilating petiolus.

Fig. 2. Habitus of *Eucharis adscendens*.

An interesting aspect of the biology of the Eucharitidae is their specificity in the selection of oviposition sites on particular species of plant. CLAUSEN (1941) even suggested that plant associations in the Eucharitidae might be more of a limiting factor in governing chalcid wasp distribution than their ant-host associations. BOUČEK (1956) reported *Falcaria*

vulgaris BERNH. (Umbelliferae) as the oviposition plant of *E. adscendens* in Bohemia (the Czech Republic). *F. vulgaris* is relatively widespread in dry and insolated habitats in Poland (SZAFER et al. 1986). However, no specimens of this umbellifer was found at the Mazovian location of *E. adscendens*. This absence is probably due to the local soil conditions being suboptimal for *F. vulgaris*, which generally occurs on limestone and clay substrates (SZAFER et al. 1986, TUTIN et al. 1992), whereas the soil type in the study locality was primarily sandy, more suitable for *P. oreoselinum*. Both *F. vulgaris* and *P. oreoselinum* belong to related clades of the so-called apioid superclade (SPALÍK et al. 2004). Thus, it seems that females of *E. adscendens* can be attracted to umbellifers belonging to different genera, as long as the odour stimuli of these plants exhibit suitable biochemical characteristics.

Recognized ant-hosts of *E. adscendens* include *Messor barbarus* (L., 1767) (Myrmicinae) (association found in Croatia) (FAHRINGER & TÖLG 1912, FAHRINGER 1922) and *Formica rufa* L., 1761 (Formicinae) (association found in Bohemia and south-western Siberia) (HOFFER & NOWICKY 1954, BOUČEK 1956, KOLOMIETZ 1985). Furthermore, LOTFALIZADEH (2008) listed *Formica glauca* RUZS., 1896 as a possible host of *E. adscendens* in Iran. In the current study, two *Formica* species, *F. cinerea* MAYR, 1853 and (less frequently) *F. rufa* were found on *P. oreoselinum* together with *E. adscendens*. Hence, one or both of these species probably serve as the host of *E. adscendens*. Both ant species nest in well insolated places. Moreover, *F. cinerea* preferentially inhabits dry and sandy soil (CZECHOWSKI et al. 2002).

The Polish location of *E. adscendens* is isolated from the main distribution range of this chalcid, which stretches from Thuringia in Germany (SCHMIEDEKNECHT 1930) through central-southern and south-eastern Europe (FÖRSTER 1859, WALKER 1873, FAHRINGER & TÖLG 1912, FAHRINGER 1922, GUSSAKOVSKIJ 1940, HOFFER & NOWICKY 1954, BOUČEK 1956, ERDÖS 1955, STEFFAN 1962, ANDRIESCU 1968, BOUČEK 1977, TRJAPITZIN 1978), the Caucasus (GUSSAKOVSKIJ 1940), north-eastern Turkey (DOĞANLAR 1984), northern Iran (GUSSAKOVSKIJ 1940, LOTFALIZADEH 2008), and Kazakhstan (GUSSAKOVSKIJ 1940, TRJAPITZIN 1978), to Bashkiriya, Perm Krai (TRJAPITZIN 1978), south-western and southern Siberia (KOLOMIETZ 1985, TSHERNYSHEV & DUBATOLOV 1998) and central Asia (GUSSAKOVSKIJ 1940) (Fig. 1). Four specimens of *E. adscendens* were also collected as far north as Swansea in South Wales (STEPHENS 1846, GAULD & BOLTON 1988), and a single specimen was found in Norfolk, England (GAULD & BOLTON 1988) (Fig. 1). However, both of these records are over a century old, and the current status of this chalcid in the British Isles is unknown. SCHMIEDEKNECHT (1930) suggests that *E. adscendens* does not occur to the north of Thuringia. In addition, this chalcid has been reported to occur in Lithuania and the Minsk Oblast in Belarus (TRJAPITZIN 1978) (Fig. 1), although the details of these locations remain unpublished.

The Mazovian population of *E. adscendens* may represent an example of a relict population from a past climatic optimum, occupying sites outside the major area of distribution for this species. This is supported by the fact that the locality of *E. adscendens* adjoins areas harbouring large isolated populations of several other insect species that usually occur further south. Examples of these species include tortoise beetles *Cassida pannonica* SUFFR., 1844 (Coleoptera: Chrysomelidae) (BURAKOWSKI et al. 1991, SZAFRANSKI 1992a), *Cassida ferruginea* GOETZE, 1777 (SZAFRANSKI 1992b), and a cuckoo wasp *Chrisis rutilans* OLIV., 1790 (Hymenoptera: Chrisididae) (SZAFRANSKI 1992c). On the other hand, since habitats that are suitable for *E. adscendens* exist throughout the entire Warsaw Basin and further south, this chalcid may in fact be more widespread than it seems to be, based on its currently known distribution. It is possible that *E. adscendens* may have been overlooked during past field surveys, particularly as the chalcidoid fauna of Poland has not been subject to extensive study (GŁOWACKI 1953, SZCZEPAŃSKI 1959, 1964). Furthermore, *E. adscendens* colonies are usually of small size with a short adult life span, and hence easy to miss (BOUČEK 1956, HERATY 2002). Finally, one cannot rule out the possibility that *E. adscendens* is currently expanding its range northwards. Climatic warming during recent decades is certainly promoting the poleward migration of thermophilic species.

Because of the scarceness of data on the occurrence of *E. adscendens* throughout the majority of its range, the origin of this species in Mazovia remains much of a mystery at the moment. Three major routes of the postglacial colonization of Poland by xerothermophilous species have been proposed: one from the west along the Noteć river to the lower Vistula, another one from the south through the Moravian Gate to the upper Vistula and Oder rivers, and the third one from southern Ukraine to the upper Vistula (LIANA 1973, BANASZAK 1980, BUSZKO 1990). Since the confirmed locations of *E. adscendens* colonies closest to Mazovia are in the Czech Republic and Slovakia (HOFFER & NOWICKY 1954, BOUČEK 1956), the most likely migration route of this species to central Poland will have been from the Moravian Gate along the River Vistula. Genotyping of the Mazovian, Moravian and Ukrainian populations of *E. adscendens* may enable this hypothesis to be confirmed and may also shed light on the potential contribution of the Ukrainian glacial refuge to the northward expansion of this chalcid.

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Received: January 03, 2011

Accepted: March 14, 2011